

REQUEST FOR RECONSIDERATION

Applicants thank Examiner Alvo for the helpful and courteous discussion of April 5, 2005. During the discussion, Applicants' U.S. representative presented arguments that because the processes of two of the prior art references cited against the claims of the present application teach away from the inclusion of  $\text{Na}_2\text{S}$  in the cooking liquors for digesting lignocellulose that the combination of these references with the primary reference is not supportable on the grounds that those of ordinary skill in the art would have no motivation to combine the references nor would there be a reasonable expectation of success.

Present independent Claims 9 and 23 require the presence of a polysulfide sulfur at a concentration of at least about 8 g/l and a  $\text{Na}_2\text{S}$ -state sulfur at a concentration of at least about 10 g/l. The Office rejected Claims 9-10, 15-21, 23-24 and 29-33 as anticipated under the meaning of 35 U.S.C. § 102(b) in view of Japanese Patent Application No. 1995-189153 (i.e., the '153 application). Applicants traverse the rejection on the grounds that the '153 application does not teach all of the present claim limitations.

As support for the rejection the Office cites to page 5, paragraph [0031] of the Office's translation of the '153 application where it is stated that the prior art cooking liquor may comprise "sodium sulfide [in a] concentration of 12.0 g calculated as  $\text{Na}_2\text{O}$  and a polysulfide concentration of 5.9 g/l" (page 3, lines 3-4 of the Office Action of March 11, 2005). In contrast, and as mentioned above, the present claims require that the polysulfide concentration in the alkaline cooking liquor is "at least about 8 g/l".

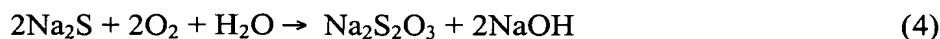
Applicants submit that a cooking liquor that has a polysulfide concentration of at least about 8 g/l is not anticipated by a prior art cooking liquor having polysulfide present in a concentration of 5.9 g/l. Applicants submit that the '153 application does not disclose at least one of the present claim limitations; namely, that the polysulfide is present at a concentration of at least about 8.0 g/l. Therefore, the '153 application cannot anticipate the present claims.

Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. § 102(b).

The Office rejected the claims in the alternative as obvious under the meaning of 35 U.S.C. § 103(a) in view of Stigsson I (U.S. 6,143,130) and Stigsson II (EP 0903436). The Office appears to have taken the position that one or both of Stigsson I or Stigsson II discloses that higher concentrations of polysulfide in cooking liquors is known to increase the yield of pulping or digestion processes. The Office appears to conclude from this position the conclusion that that the presently claimed invention is obvious because Stigsson I/II disclose that higher concentrations of polysulfide may be favored in some prior art processes.

Applicants traverse the Office's combination of Stigsson I and/or Stigsson II with the '153 application as a basis for determining that the claimed invention is obvious. As mentioned above, the presently claimed invention requires (i) that the polysulfide concentration is at least about 8 g/l and (ii) that the Na<sub>2</sub>S-state sulfur is present at a concentration of at least about 10 g/l. In the claimed invention, both the polysulfide and the Na<sub>2</sub>S-state sulfur materials must be present in certain minimum quantities.

Applicants submit that neither of the Stigsson prior art references discloses that Na<sub>2</sub>S-state materials must be present in the prior art cooking liquors. Applicants submit that the Stigsson prior art references actually teach away from the inclusion of Na<sub>2</sub>S in the prior art cooking liquors. Each of the Stigsson prior art references discloses the following four formulae:



Applicants submit that this series of equations demonstrates that the presence of  $\text{Na}_2\text{S}$  in the Stigsson cooking liquors is disfavored and may force the equilibrium of the prior art reactions in an undesired direction. For example, in equation (1) the  $\text{Na}_2\text{S}$  appears on the right-hand side of the equation. If a greater quantity of  $\text{Na}_2\text{S}$  is present in the Stigsson cooking liquors (e.g., as is the case for the cooking liquors of the '153 application) the equilibrium of this equation will be forced to the left. Applicants submit that this is disfavored in the prior art process because an equilibrium favoring the right-hand side of equation (1) is desirable to stabilize heavy cellulose and lignocellulose by the formation of a stable carboxyl group (column 1, lines 33-35).

Applicants submit that the  $\text{Na}_2\text{S}$ -state sulfur concentration of at least about 10 g/l recited in the present independent claims would not be foreseen as advantageous by those of ordinary skill in the art as evidenced by Stigsson's disclosure of a formula that indicates that larger amounts of  $\text{Na}_2\text{S}$  will force the reaction equilibrium in an undesired direction.

Increased amounts of  $\text{Na}_2\text{S}$  may also lead to increased amounts of sodium thiosulfate per equation (4) above. Thiosulfate (i.e.,  $\text{Na}_2\text{S}_2\text{O}_3$ ) is undesirable in the prior art processes as evidenced by its description as "inert" (column 3, line 21) and the fact that one of the features of the prior art invention includes the formation of a cooking liquor that is "substantially free of thiosulfate" (column 4, lines 6-8 and 47-48). The reaction represented by formula (4) above is described as follows in Stigsson II:

In spite of some initial commercial success the partial oxidation routes suffer from serious *disadvantages*. Competing side reactions during oxidation resulting in formation of inert thiosulfate cannot be avoided (page 3, paragraph [0035]).

Thiosulfate is an inert in kraft cooking systems and besides the dead load, thiosulfate corrosion have been reported in digesters and impregnation vessels (page 5, lines 49-50).

Applicants submit that Stigsson would lead those of ordinary skill in the art to believe that Na<sub>2</sub>S is not desired to be present in high concentrations in the prior art lignocellulose cooking process.

Applicants submit that the disclosure in Stigsson that Na<sub>2</sub>S may force the equilibrium of a desired reaction in the wrong direction and form thiosulfate which is explicitly described as an undesired side product (e.g., inert and corrosive) would not provide those of ordinary skill in the art with motivation to combine the process of the '153 application with the Stigsson process. Applicants further submit that those of ordinary skill in the art may not have a reasonable expectation of successfully carrying out a lignocellulose cooking or pulping process using an amount of Na<sub>2</sub>S-state sulfur in an amount of 10 g/l or greater in view of the contradictory and disparaging disclosure of Stigsson.

Stigsson discloses a process having steps (c) to (g) in which a spent cooking liquor is extracted from mixtures obtained in prior steps (a) and (b). The spent cooling liquor is gasified to obtain a polysulfide which is then added to a later cooking step (i) (see column 3, line 58 through column 4, line 13 and column 4, lines 52-55). Step (g) is recited to include a polysulfide concentration of 10 g/l; but this concentration is not a cooking concentration but is instead the concentration of the polysulfide liquor produced in step (i) of Stigsson.

Applicants submit that this polysulfide material does not teach the addition of a polysulfide liquor of at least 10 g/l concentration to a cooking process but instead teaches the *production* of a polysulfide liquor of about 10 g/l concentration.

In fact, Figure 2 of Stigsson shows that the polysulfide liquors are diluted before they are added to any cooking step. For example, Figure 2 shows that a black liquor (102) and a white liquor (112) are supplied to an impregnation vessel (100). The black and white liquors from the impregnation vessel are added to a digester (104) and the polysulfide liquors added to the impregnation vessel and the digester through a conduit (92) are diluted. Thus the

polysulfide concentration of the liquors added to cooking are much lower than the minimum 10 g/l of the present claims (column 11, line 55 through column 12, line 9).

Stigsson further discloses that it is necessary to reduce the cooking temperature to a temperature lower than the conventional temperature in order to prevent decomposition of the polysulfide. For example it is stated at column 8, lines 50-52:

To retain polysulfide at a relatively stable condition during cooking, the cooking temperature should be reduced in relation to conventional cooking temperatures. Suitable cooking temperatures for polysulfide stabilization are from about 120 to about 150.degree.

Stigsson does not disclose that it is possible to stabilize polysulfide with an Na<sub>2</sub>S-state sulfur.

In contrast to Stigsson the invention process may be carried out at a temperature of up to 170°C (see present Example 1 and page 23, lines 12-14). An elevated cooking temperature may lead to a shortened cooking time which is economically desirable, an advantage not disclosed in Stigsson.

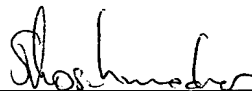
For the reasons described above, Applicants submit the presently claimed invention is novel and not obvious in view of the prior art relied upon by the Office. Applicants respectfully request the withdrawal of the rejections and the passage of all now-pending claims to Issue.

Respectfully submitted,

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